**Institute** of Environmental Sciences

**Topic:** The effects of the environment on pace of life and microbiome of bank voles

**Name of supervisor: prof. dr hab.** Paweł Koteja, Anni Hämäläinen

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**Background information (max 200 words):**

An animal and its gut microbiome (the community of microbes inhabiting the gut) coevolve and should, therefore, respond to the environment as a unit. The microbiome participates in extracting energy from food and can thus be especially important in matching the energy requirements of the animal with resource restrictions posed by its environment. Coping with limited resources should depend on both the animal’s metabolic demands and the efficiency of the microbiome to extract energy from food eaten by the animal.To test this idea, we will study the effects of environmental manipulations at different life stages on the life history and physiology of animals from a unique experimental evolution model system: selection lines of a non-laboratory rodent, the bank vole (*Myodes glareolus*),selectively bred for a high metabolic rate and unselected control lines. We will also examine associated changes in the gut microbiome. We will test hypotheses about the role of the microbiome in influencing the fitness of the animal host through lab and field experiments.

**The main question to be addressed in the project:**

Does the microbiome mediate the effects of environmenton the fitness of individuals with different energetic needs?

**Information on the methods/description of work:**

* Conducting experiments with captive voles in Krakow and participating in field experiments in field enclosures in Finland.
* Taking physiological measurements, monitoring life history traits (e.g. pup growth, reproductive success), sampling and analysing the gut microbiota (by sequencing a region of the 16S-gene to identify bacterial taxa) and conducting the associated bioinformatics and statistical analyses.
* Presenting work at local and international conferences and preparing publications in close collaboration with an international team.

**Additional information (e.g.Special requirements from the student):**

* Requirements:
  + MSc degree in a relevant field by July 2019;
  + evidence of good quantitative/computational skills;
  + strong English language, communication, organizational and collaboration skills.
  + Previous experience with small mammals, microbial communities, bioinformatics, animal physiology and/or evolutionary biology are considered advantageous.

An NCN stipend (4500 PLN/month) is available for one student for 3 years in addition to the stipend offered through the regular PhD program.

**Place/name of potential foreign collaborator:**

University of Jyväskylä, Finland (Prof Phillip Watts, Dr Tapio Mappes, Dr Esa Koskela)

**References:**

Kohl, K. D., Sadowska, E. T., Rudolf, A. M., Dearing, M. D., &Koteja, P. (2016). Experimental evolution on a wild mammal species results in modifications of gut microbial communities. *Frontiers in microbiology*, *7*, 634.

Sadowska, E. T., Stawski, C., Rudolf, A., Dheyongera, G., Chrząścik, K. M., Baliga-Klimczyk, K., & Koteja, P. (2015). Evolution of basal metabolic rate in bank voles from a multidirectional selection experiment. *Proceedings of the Royal Society B: Biological Sciences*, *282*(1806), 20150025.

Zilber-Rosenberg, I., & Rosenberg, E. (2008). Role of microorganisms in the evolution of animals and plants: the hologenome theory of evolution. *FEMS microbiology reviews*, *32*(5), 723-735.